



*David S. Vandergriff
Area Specialist
Ornamental Horticulture*

*Wayne K. Clatterbuck
Associate Professor
Forestry, Wildlife & Fisheries*

Successfully transplanting trees depends on decisions and production practices that take place long before the first shovel of soil is turned. Selecting the right species and high-quality nursery stock based on planting site characteristics, available care after planting, transplant size, root ball characteristics and nursery production practices is essential to successful transplanting. The rewards for attention to these details will be realized as the transplanted tree matures and increases its importance to your property.

Trees experience tremendous stress in the transplanting process, primarily from adverse changes in their ability to absorb water due to root loss. Water stress is the primary cause of transplant failure. Root loss affects hormone synthesis and distribution that regulate shoot growth. Root loss also reduces carbohydrate storage, affecting energy available for rapid root regeneration, critical for transplant survival. The ability of a tree to maintain sufficient vigor while recovering from the adversities of transplanting will determine its success or failure.

Trees have traditionally been offered for sale in the nursery trade using three methods: bare-root, balled and burlapped (B&B), and containers including pot-in-pot and in-ground fabric containers.



David Vandergriff

(a)

Bare-Root

Bare-root production systems have several advantages. Bare-root trees can be produced less expensively than trees produced in other systems due to easier digging, storing and shipping, since the soil is not kept with the roots when the tree is dug. The root system can be inspected, and inferior or defective roots can be removed. The range of tree sizes is limited in bare-root transplants due to the inability to move larger trees successfully. Seasonal constraints



David Vandergriff

(b)



David Vandergriff

(c)

Examples of (a) bare-root, (b) balled and burlapped, and (c) above ground pot-in-pot nursery production systems.

are greater in this production system because bare-root trees should be dug and transplanted during the dormant season (December-March). Careful handling of bare-root transplants is necessary to avoid root desiccation. Bare-root trees often require staking to avoid windthrow following leaf emergence.

Balled and Burlapped

Balled and burlapped (B&B) is the most traditional method of transplanting trees. These trees are available in a wide range of sizes and are commonly found in nurseries. Compared to bare-root transplants, B&B trees can be planted over a longer period of time and have less stringent handling and storage requirements. B&B trees can be hand dug or dug with mechanical tree spades. B&B trees can be transplanted anytime the ground is not frozen. The shape of the root ball can be easily altered to facilitate special planting conditions such as compacted or high water table soils. The need for staking following planting is less likely due to the weight of the soil in the root ball.

The primary disadvantage to B&B trees is that usually 95 percent of the original root system of the tree is left in the field. The weight of the soil on larger B&B trees results in increased shipping costs and the possible need for specialized equipment to handle and plant the trees.

Above-Ground Containers

A tree produced in an above-ground container has the advantage of being transplanted with all of its root system. The well-drained artificial media used in above-ground containers is considerably lighter than field soils found in B&B trees, making these trees less expensive to transport and easier to handle. The use of in-ground fabric containers may also reduce the weight of the treeball. Trees produced in above-ground containers are available for planting any time of year, as long as the soil is not frozen.

The major disadvantage of above-ground container production is increased defects, such as girdling roots and lethal high root temperatures on the south and west sides of the container. Above-ground containers are subject to blowing over in winds at the nursery, causing wounds to the tree. Pot-in-pot production systems reduce both the lethal root temperatures on the south and west sides of the pot and the incidence of blowing over.

Pre-plant Handling

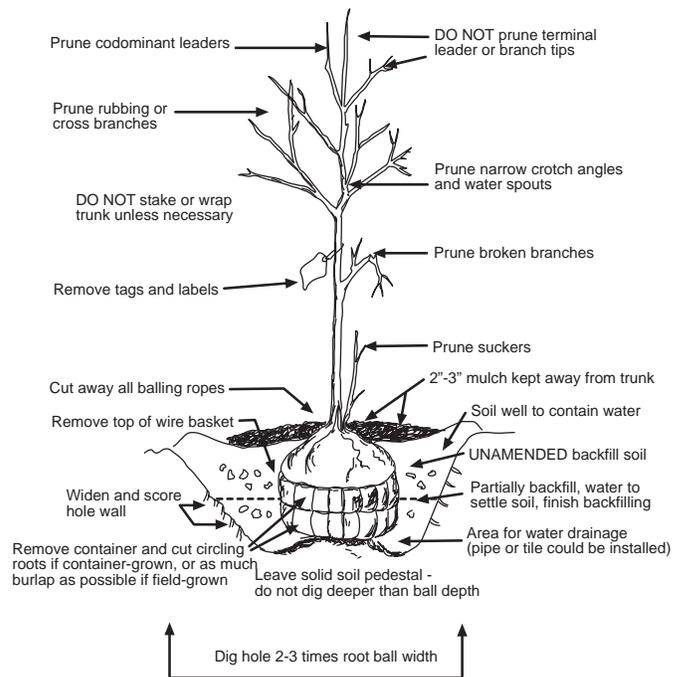
Careful handling of the root ball is absolutely necessary to prevent damage to the tree prior to transplanting. Root balls are fragile regardless of the production technique used; however, B&B trees and those in soft fabric containers are the most easily damaged. Never pick up or carry a tree by its trunk, especially a B&B tree, due to the weight of the root ball. Always secure the tree during transport so the root ball is not damaged, resulting in broken roots. Trees

should be watered well prior to transporting and should be covered to reduce water loss. Plant the trees as soon as they arrive at the planting site. If this is not possible, water the trees well and place them in a holding area away from wind and the direct sun. B&B trees should be healed-in to protect the root ball from desiccation if immediate planting is not possible. Regular watering should be provided until the planting is completed.

Planting

The most common mistakes in transplanting trees are planting too deep, and over or under watering. Careful attention to properly preparing the planting hole greatly increases the odds of successfully transplanting trees. The planting hole should be at least three times as wide as the root ball, have sloped sides, and be no deeper than the rootball. Plant the tree about two inches higher than the surrounding ground to allow settling of the root ball and prevent ponding of water at the tree base. If the tree is bare-root, be sure to spread the roots before backfilling. If a container tree is being planted, be sure to cut and spread out the roots to prevent girdling.

After the tree is set in the planting hole at the proper depth, gently remove the pinning nails or rope lacing so the burlap can be cut and removed from the sides of the root ball. The burlap at the bottom of the root ball should be left. Removing the bottom burlap may injure the roots. If a wire basket has been used, cut away as much of the basket as possible without disturbing the root ball. This will avoid any conflicts with the roots or with any equipment used later



Source: Appleton and French 1995

if the tree dies and the stump is removed. Remove any rope or other tying materials, plant tags or labels from the trunk to avoid girdling.

Gently backfill the planting hole with the soil that was removed from the hole with no additional amendments. If amendments are used, differences in soil pore sizes will be created causing problems with water movement, water retention and root growth between the root ball, planting hole and surrounding soil. When the hole is about halfway filled in, pack the soil tightly and water the tree to settle any air pockets and to assure good contact between the soil and tree roots. Finish backfilling the hole, then water the tree thoroughly.

Mulch should be placed around newly planted trees to help conserve moisture and reduce competition for moisture from turfgrass. Be careful not to over-mulch (2 to 3 inches is the optimum depth), keeping the mulch 6 inches away from the trunk of the tree to avoid disease problems and rodent damage.

If fertilizer is applied at planting, use a slow-release fertilizer at a rate not to exceed 1 lb. of actual nitrogen per 1,000 sq. ft. Avoid using fast-release fertilizers to avoid root burn. Staking should only be done if absolutely necessary and any stakes should be removed within a year following planting. Be careful that the staking materials do not injure the trunk of the tree or girdle the tree. Prune only broken or diseased limbs at planting.

The need for watering following transplanting cannot be overemphasized. The larger the tree that is transplanted, the more watering is necessary. Tree wraps are not necessary following transplanting, as research has shown that they have no beneficial effects. Loose-fitting guards may be installed for protection from animal or equipment damage as long as they permit good air circulation.

Careful attention to details in tree planting will improve the probability of success. Correctly planted trees will bring years of enjoyment and will enhance your property.



Transplanting Guidelines

1. Plan ahead to match the species to the area or site to be planted, i.e., plant the right tree in the right place. Is the site appropriate for the tree that you want to place there?
2. Select high-quality plants without visible damage at the nursery or local garden center. Look for vigorous growth, good leaf color and roots that are white and firm.
3. Be careful in handling and transporting the tree to the planting site. Take extra care not to damage the bark or the root system.
4. Properly prepare the planting hole. The hole should be at least three times as wide as the root ball, have sloped sides and be no deeper than the root ball.
5. Plant the tree as soon as possible. Do not use soil amendments. Backfill with the same soil which was removed from the hole. Mulch.
6. Water, but do not overwater, newly transplanted trees. Irrigate slowly so that water infiltrates and soaks the ground. Watering for several years, especially during droughty periods, may be necessary until the tree is fully established.

References

Gilman, Edward F. 1997. *Trees for Urban and Suburban Landscapes*. Delmar Publishers, Albany, New York.

Harris, J, Roger and Nina L. Bassuck. 1993. Tree planting fundamentals. *Journal of Arboriculture* 19(2): 64-70.

Appleton, Bonnie L. and Susan French. 1995. *Tree and shrub planting guidelines*. Publication 430-295. Virginia Cooperative Extension, Virginia Tech University, Blacksburg, VA.



David Vandergriff

Circling roots are common in containerized plants. Roots should be cut in a few places to initiate new roots and prevent circling roots from eventually girdling the tree trunk.



David Vandergriff

Mechanical tree spade.



David Vandergriff

Fabric container grow bag.

Appreciation is expressed to Sam Jackson for design of this publication.

SP 572 - 15M - 12 - 00

R12 - 4910 - 21 - 004 - 01

The Agricultural Extension Service offers its programs to all eligible persons regardless of race, color, national origin, sex, age, disability, religion or veteran status and is an Equal Opportunity Employer. COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture, and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.
Agricultural Extension Service Charles L. Norman, Dean

Printing for this publication was funded by the USDA Forest Service through a grant with the Tennessee Department of Agriculture, Division of Forestry. The *Trees for Tennessee Landscapes* series is sponsored by the Tennessee Urban Forestry Council.

